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Introduction

Plume Mapping Purpose and Scope

The University of Texas at Dallas (UT Dallas) developed the E-Plan real-time chemical plume modeling for first responders use only. This tool is used primarily for planning situations, where the goal is to assess the threat posed to the general public by a chemical release.

Authorized E-Plan users can use this mapping tool to plot a chemical plume and view census information on a Google map. Public facilities such as schools and hospitals are provided within the potential impacted circle. This plume model has been extensively tested with selected first responders.

Limitation of Liability

UT Dallas has used its best efforts to incorporate accurate and complete data real-time into E-Plan chemical plume modeling. Nevertheless, UT Dallas is not responsible for errors and omissions, and is not liable for any direct, indirect, or consequential damages flowing from the recipient’s use.

A List of Chemicals

The following table includes a partial list of the selectable chemicals in E-Plan Chemical Plume Model's library and click here to see complete list:

<table>
<thead>
<tr>
<th>CAS Number</th>
<th>Chemical Name</th>
<th>LOC Type</th>
<th>LOC Level 1</th>
<th>LOC Level 2</th>
<th>LOC Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>51752</td>
<td>MECLORETHAMINE</td>
<td>PAC</td>
<td>0.003</td>
<td>0.022</td>
<td>0.07</td>
</tr>
<tr>
<td>56235</td>
<td>CARBON TETRACHLORIDE</td>
<td>ERPG</td>
<td>20.0</td>
<td>100.0</td>
<td>750.0</td>
</tr>
<tr>
<td>57067</td>
<td>ALLYL ISO THIOCHLORIDE</td>
<td>PAC</td>
<td>1.0</td>
<td>2.5</td>
<td>12.5</td>
</tr>
<tr>
<td>57147</td>
<td>I,1-DIMETHYL HYDRAZINE</td>
<td>PAC</td>
<td>0.5</td>
<td>3.0</td>
<td>11.0</td>
</tr>
<tr>
<td>57578</td>
<td>BETA PRO POLACTONE</td>
<td>PAC</td>
<td>0.509</td>
<td>5.09</td>
<td>15.0</td>
</tr>
<tr>
<td>60242</td>
<td>THIOGLYCOL</td>
<td>PAC</td>
<td>2.0</td>
<td>12.5</td>
<td>20.0</td>
</tr>
<tr>
<td>60944</td>
<td>METHYL HYDRAZINE</td>
<td>PAC</td>
<td>0.2</td>
<td>0.9</td>
<td>2.7</td>
</tr>
<tr>
<td>62533</td>
<td>ANILINE</td>
<td>AEGIL</td>
<td>8.0</td>
<td>12.0</td>
<td>20.0</td>
</tr>
<tr>
<td>64197</td>
<td>ACETIC ACID, GLACIAL</td>
<td>ERPG</td>
<td>5.0</td>
<td>35.0</td>
<td>250.0</td>
</tr>
<tr>
<td>64875</td>
<td>DIETHYL SULFATE</td>
<td>PAC</td>
<td>0.2</td>
<td>1.5</td>
<td>25.0</td>
</tr>
</tbody>
</table>

Showing 1 to 10 of 219 entries
Process Flow Diagram
E-Plan Chemical Plume Mapping Training Manual

E-Plan Plume Step by Step Tutorial

In this tutorial, you will learn how to plot a plume for Chlorine release at a fictional treatment plant in Texas.

Login to E-Plan

- Open a web browser and enter [https://erplan.net](https://erplan.net)
- Enter UserID = demo-im and password = training
- Click the "Login" button

Choose a Facility

- Click the "Facility Search" option on the left side menu
- Enter in the Facility ID as "1288141" and click the "Search" button. The Facility Search Result page will appear

- Click on the "ISSPEC CHEM INC (DEMO)" link to select that facility. The Facility Information page will appear
Select a Chemical

- Scroll down to the "Chemical Inventory Information" section
- Locate the Chlorine chemical

**Note:** The "Show Chemical Plume" is displayed under the chemical selectable in the E-Plan Chemical Plume Model

- Click on "Show Chemical Plume" link

A new browser tab will open and show the "Real-Time Chemical Plume Mapping & Geographic Information Reporting System" homepage.
Create New Plume

- Click the **Create New Plume** button
  A pop-up warning window will appear. You must read and understand the warning information prior to clicking the **OK** button to proceed.

Welcome to E-Plan chemical plume mapping system.

DO NOT refresh the page during mapping process.
DO NOT use the back arrow button.
Click **Exit** button if you would like to leave the system.
Your session will be timed out in 40 minutes.

Check/Edit the Model Settings

The E-Plan Chemical Plume Mapping web page consists of three sections: Top menu bar, Google maps, and model settings.

**Top menu bar** contains the following application and system menus:
- E-Plan Chemical Plume Mapping **Clicking on E-Plan Chemical Plume Mapping** will return to the E-Plan Chemical Plume homepage
- About **About the E-Plan Chemical Plume homepage**
- Contact **Contact us**
- Instructions **Training manual**
- Exit
- Draw Plume
- Download

**Google maps** displays a red marker at the selected facility location.
Clicking on the red marker opens an information window, which displays the Facility Name, Address, Latitude, Longitude and USNG information.

Model settings section includes the basic information, chemical information, and site conditions.

**Basic Information**

- **Plume Server Time:**
  The system will display the plume server time in 24 hour format, calendar date, and Central time zone.

- **Session Remain Minutes:**
  This countdown timer shows exactly how much time remains before your session is timed out.

- **Redraw Time:**
  The system will redraw plume with the latest data.
  
  - Enter the time interval between plume profile redraws
    - Value should be between 0.5 to 10 minutes

**Chemical Information**

- **Chemical Name:**
  The system will automatically display the selected chemical.

- **Chemical CAS #:**
  The system will automatically display the assigned CAS number of selected chemical.

- **Toxic Levels of Concern:**
The system will display the appropriate toxic levels of concern (LOCs) for each chemical.

See Appendix for more information about LOCs
Source: https://response.restoration.noaa.gov/oil-and-chemical-spills/chemical-spills/resources/toxic-levels-concern.html

Three most common public exposure guidelines are Acute Exposure Guideline Levels (AEGLS), Emergency Response Planning Guidelines (ERPGs), and Protective Action Criteria for Chemicals (PACs). AEGLS, ERPGs, and TEELs all have three tiers of exposure values for each covered chemical. There are some key differences between the different types of exposure guidelines, however, at a very general level, the tiers are similar: the first tier (e.g., AEGL-1) is a mild effects threshold, the second tier (e.g., AEGL-2) is an escape-impairment threshold, and the third tier (e.g., AEGL-3) is a life-threatening effects threshold.

- **AEGL-1.** Notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

- **AEGL-2.** Irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

- **AEGL-3.** Life-threatening health effects or death.

Source of Contamination:
Select one of the two options.

- **Continuous.** A source that releases gas into the atmosphere at a constant or near-constant rate for an extended period of time

  Note: If you choose Continuous, you must enter the Release Duration.
• **Instantaneous.** A very short-term release that lasts 1 minute

  **Note:** If the Source of Contamination is Instantaneous, you DO NOT need to enter the Release Duration.

  ❖ **Chemical Amount:**
  By default, the system will automatically display the maximum daily amount of the chemical stored at the facility.

  • You can change the value. Enter the chemical amount
    ○ Value should be between 1 and 999,999,999 pounds

  ❖ **Release Speed Unit:**
  Select one of the following options.
  • pounds/sec
  • pounds/min
  • pounds/hour

  ❖ **Release Duration (1 to 60 minutes):**
  If the Source of Contamination is Continuous, you must enter the Release Duration.

  • Enter the duration of the chemical release in whole minutes
    ○ Value should be between 1 to 60 minutes

**Site Conditions**

❖ **Cloud Cover Conditions:**
Select one of the three options.
• Clear
• Partly Cloudy
• Overcast

❖ **Ground Conditions:**
Select one of the three options.
• Open Country (Open Ground)
• Urban or Forest (Rough Ground)
• Open Water
Automated Mapping Process

- Click the Draw Plume button to start the mapping process. During the mapping process, all of the model settings turn non-editable and the Draw Plume button is disabled.

*** IMPORTANT NOTE ***
The mapping process may take several minutes, please be patient and DO NOT refresh page during processing.
Upon completion, the chemical plume is displayed on the map along with the polygons, which denote the different blocks within the impacted area that is encircled.

- The census information of all the blocks within the impacted circle is displayed on the right side of the page, which includes the Total Population, Total Household, and Total Blocks.
- The plume will be refreshed with the latest data after the redraw time interval.
Displaying Nearby Schools and Hospitals

 Schools:

You can check the “School” check box to display all the nearby schools on the map.

- From the pre-populated list, choose a particular school to highlight it on the map
- When you click an icon of a particular school, the system will display the name, county, state, latitude, longitude information of that school
Hospitals:
You can check the ‘Hospital’ check box to display all the nearby hospitals on the map.

- From the pre-populated list, choose a particular hospital to highlight it on the map
- When you click an icon of a particular hospital, the system will display the name, county, state, latitude, longitude information of that hospital
Displaying Census Information

- Click on any of the blocks denoted by the polygons to get the detailed census information for that block.
  - The pie chart shows the percentage distribution of population across the different age groups ranging from 5-14 years, 15-24 years, 25-29 years, 40-49 years, 50-64 years, and more than 65 years of age.
Move Plume
The Plume model is automatically plotted based on the facility's latitude and longitude. However, you can manually move the plot point (i.e., facility icon) once the plot is drawn.
- Using the computer mouse, you can click and drag the facility icon to a new location.

Download Plume
- You can download the Plume map by clicking on “Download” button

System will create “plume.png”

- You can view the downloaded Plume map or save “plume.png” file.
Print Plume

- You can press `Ctrl+P` to view a print review of the plume.

- Select the appropriate printer from the printer drop-down box and click on `Print`
Exit Plume

- Click the "Exit" button on the top right corner to manually end your session.

You can either click [here](#) to return to the E-Plan portal or close the web browser.
Getting Help

If you encounter any problems during the mapping process, please click "Exit" and wait 10 minutes before you log back into E-Plan.

You can use the Contact Us button on any E Plan website page to send us your comments or report any problems you have experienced when using the E-Plan Chemical Plume Mapping application.
Appendix - ALOHA Toxic Levels of Concerns (LOCs)

Source: https://response.restoration.noaa.gov/oil-and-chemical-spills/chemical-spills/resources/levels-concern.html

In ALOHA, a Level of Concern (LOC) is a threshold value of a hazard (toxicity, flammability, thermal radiation, or overpressure).

ALOHA includes the following LOCs to model different hazards:

- Toxic LOCs
- Flammable LOCs
- Thermal Radiation LOCs
- Overpressure LOCs

Public Exposure Guidelines are intended to predict how members of the general public would be affected (that is, the severity of the hazard) if they are exposed to a particular hazardous chemical in an emergency response situation.

The most common public exposure guidelines are:

- AEGLs (Acute Exposure Guideline Levels)
- ERPGs (Emergency Response Planning Guidelines)
- TEELs (Temporary Emergency Exposure Limits)

Each of these guidelines has three tiers of exposure values (e.g., AEGL-1, AEGL-2, and AEGL-3) for each covered chemical. There are some key differences between the exposure guidelines; however, at a very general level, the tiers are similar:

1) The first tier (e.g., AEGL-1) is a temporary, non-disabling effects threshold.
2) The second tier (e.g., AEGL-2) is a disabling (escape impairment) threshold.
3) The third tier (e.g., AEGL-3) is a life-threatening effects threshold.

ALOHA determines its default toxic LOCs based on the following hierarchy:

1) AEGLs are used preferentially, because they are the best public exposure LOCs to date. Additionally, AEGLs are designed for nearly all members of the general public. About 175 substances have final AEGLs as of mid-2016, and there are interim AEGLs defined for about 80 additional substances.

2) ERPGs are used next. They are developed from experimental data like the AEGLs but ERPG values are only available for a 60-minute exposure duration and they are not designed as guidelines for sensitive individuals. ERPGs have been defined for about 150 chemicals.

3) PACs (Protective Action Criteria for Chemicals) are used next. If ALOHA is defaulting to the PAC values, it means that there are no AEGL or ERPG values in the ALOHA chemical library for that substance. In this case, the PAC values will be the TEEL values. TEELs are derived using existing LOCs and by manipulating current data. This process is less intensive than the AEGL or ERPG process, and TEELs have been defined for more than 3,000 chemicals.

4) IDLH (Immediately Dangerous to Life and Health) limits are used when no public exposure guidelines are defined for a given chemical. An IDLH limit is a workplace exposure limit that is used primarily for making decisions regarding respirator use. In the 1980s, before public exposure...
guidelines were available for most common chemicals, the IDLH limit was used in public exposure situations. Unlike the three-tiered public exposure guidelines, only a single IDLH value is defined for applicable chemicals.

Some chemicals are defined under multiple hazard classification systems. In these cases, ALOHA will provide the default value according to the above hierarchy, but it will also provide others as LOC options. Additionally, you can also specify your own LOCs (see the Ask Dr. ALOHA article on choosing toxic LOCs).